Mini-Tracks

What is a mini-track (my definition)

Use cases

Mini-track design

Use strategies

Status

What is a mini-track?

- **A self-contained persistent form of a track**
  - **Hits and other event data all contained in one object**
  - **No dependence on existing Raw or Reco quantities**
- **A normal TrkRecoTrk reconstituted from this compact persistent data**
  - **Kalman fit representation**
  - **Multiple mass hypo fits**
  - **Access to hit-on-track (Hot) information (residuals, …)**
- **An track interface which maximizes efficiency**
  - **Cache commonly-accessed values**
    - Default PID helix parameters at origin, ...
  - **Compute expensive information only on demand**
    - Hit residuals, ...
  - **Lots of flexibility and tunability**

Mini-track use cases

- **Alignment calculation**
  - **Store SVT Hots plus parameters at DCH**
    - Minimum data content needed to compute alignment
  - **Store only those tracks useful for alignment**
- **Environment updating**
  - **Tracks can be refit with new environment constants**
    - Alignment, calibration, material model, Bfield map,...
  - **Could be used to generate micro (reprocessing source)**
- **Event display**
  - **Display full trajectory and hits in space**
  - **Study physics and detector performance**
- **Detailed analysis**
  - **All mass hypothesis fits available**
  - **Add/remove hits based on vertexing or B reconstruction**

Mini-track persistence design

- **Compact storage of helix fit information**
  - **5 Parameters and errors**
  - **Full Correlation matrix**
  - **Flight range, Mass Hypothesis, fit chisq prob.**
  - **Total size of 36 bytes**
    - Micro 'track' (BtaFitParamsP_001) ~80 bytes, less information
- **Compact version of SVT Hot**
  - **Contains all position, time, and PID information**
  - **8bytes/HOT, ~500 bytes/hadronic event**
- **Compact version of DCH Hot**
  - **Contains all position, time, and PID information**
  - **(preliminary) 8bytes/HOT, ~2KBytes/hadronic event**
- **Can store any combo of helices and Hots**

Possible exploitation strategies

- **Store helix for default hypo at origin + Hots**
  - **Can answer most physics questions without refitting**
  - **other hypos, outer/interior fits, residuals on demand**
- **Store DCH fit at support tube and SVT Hot**
  - **Svt local alignment**
- **Store helix at first,last hit for N most likely hypos**
  - **Can extrapolate in to the origin, out to Dirc, Emc, Ifr**
    - Full Material model and Bfield map
  - **Fit of long-lived particles will be correct (as we can)**
- **Any combination/mixture in between**
  - **Most common helices + Svt Hots**
  - **...**

Status

- **Svt mini-hot complete**
  - **Released in 9.8.0**
  - **For details, see recoTracking/384.html**
- **Dch mini-hot Design complete**
  - **Will be ready for 9.9.0**
  - **For details, see http://www.pd.infn.it/~stroili/mini-DB.pdf**
- **Helix packing complete**
  - **Will be ready for 9.9.0**
  - **For details, see recoTracking/401.html**
- **Objectivity design complete**
  - **Preliminary version may be released in 9.9.0**
- **Transient design still under development**
  - **Full functionality will not be ready until December**

Conclusions

- **A new way of storing tracks is under development**
  - **A compact persistent class can store any combination of Hots and fit parameters**
  - **The interface will provide the full Kalman fit information**
    - ▲ Multiple mass hypothesis fits
    - ▲ Optimal helix parameters at origin, dirc, $K0_s$ decay point, ...
- **Homework for AWGs and physics management**
  - **What configuration(s) would best balance the needs of efficiency (space and time) against accuracy?**
  - **Should we replace the micro 'track'?**
    - ▲ Mini-track has more compact information, Kalman interface
    - ▲ Would require re-implementation of PID-track interface
      - ◆ Use of mass-hypo specific fits
      - ◆ Compute angles and momentum at dirc and emc